Spatial Verification of Atmospheric Rivers

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It is well known that CSI, POD, FAR and other skill scores deteriorate with the extremeness of the precipitation event being forecast. Statistical approaches such as the application of ensembles, when applied to the precipitation itself, are of little help improving the scores for such events and are not particularly informative as to the reasons for error. Fortunately, in the case of North American Pacific Coast extreme precipitation events (which are a focus of the HMT) most are caused by land-falling atmospheric rivers, a physical entity that often telegraphs its arrival a week or weeks in advance, thanks to rapidly advancing observational and modeling capabilities. The forecasting problem has been largely reduced to increasing the accuracy of predicting the time, location, AR intensity, and duration of these landfalls and in getting the microphysics, including the orographic forcing, correct in the models. To aid in this effort, new verification metrics are needed that speak directly to these needed accuracies.

Object analysis is an available tool well suited to providing many of these needed new metrics, and is an AR verification approach the HMT-DTC Collaboration Committee has, with USWRP support, taken in developing metrics that measure and quantify the prognostic accuracy of AR landfall time, location, AR intensity, and duration. DTC's MET/MODE package, which can be implemented in the real time forecast post processing stream, is used to identify and characterize IWV and IVT objects in GFS forecast and SSMI observational data fields. The resulting attributes can then be used to build the needed metrics, which can be incorporated in statistical studies across campaigns. Now in the third year of development, a multi-scale approach has been implemented, which uses a large synoptic scale domain covering much of the Northeast Pacific to verify forecast GFS IWV data fields against SSMIS observations; an intermediate domain extending about 1000 km out from the coast to visually identify positional biases; and a longitudinally narrow coastal strip to objectively identify landfall events, specify their central location, time and area of occurrence, duration, and intensity.